TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 USC 371

International Application No.:	PCT/NL00/00154
International Filing Date:	March 8, 2000
Priority Date Claimed:	March 8, 1999
Title of Invention:	METHOD AND DEVICE FOR ROTATING A WAFER
Applicants for DO/EO/US:	Vladimir Ivanovich Kuznetsov, Sijbrand Radelaar, Jacobus Cornelis Gerardus Van Der Sanden, and Theo Anjes Maria Ruijl

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. (X) This is a **FIRST** submission of items concerning a filing under 35 USC 371.

2. (X) This express request to begin national examination procedures (35 USC 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 USC 371(b) and PCT Articles 22 and 39(1).

3. (X) A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

4. (X) A copy of the International Application as filed (35 USC 371(c)(2))

   a) () is transmitted herewith (required only if not transmitted by the International Bureau).
   b) (X) has been transmitted by the International Bureau.
   c) () is not required, as the application was filed in the United States Receiving Office (RO/US).

5. (X) Amendments to the claims of the International Application under PCT Article 19 (35 USC 371(c)(3))

   a) () are transmitted herewith (required only if not transmitted by the International Bureau).
   b) () have been transmitted by the International Bureau.
   c) () have not been made; however, the time limit for making such amendments has NOT expired.
   d) (X) have not been made and will not be made.

6. (X) Notification of Transmittal of the International Preliminary Examination Report with a copy of the International Preliminary Examination Report and any annexes thereto, such as any amendments made under PCT Article 34.

7. (X) An Information Disclosure Statement under 37 CFR 1.97 and 1.98 with PTO-Form 1449 and five (5) references.

8. (X) A FIRST preliminary amendment.

9. (X) International Application as published.

10. (X) Two (2) sheets of drawings.

11. (X) A return prepaid postcard.

12. (X) The following fees are submitted:

				FEES
	BASIC FEE			$860
CLAIMS	**NUMBER FILED**	**NUMBER EXTRA**	**RATE**	
Total Claims	12 - 20 =	0 ×	$18	$0
Independent Claims	2 - 3 =	0 ×	$80	$0
Multiple dependent claims(s) (if applicable)			$270	$0
	TOTAL OF ABOVE CALCULATIONS		$860	
Reduction by 1/2 for filing by small entity (if applicable). Verified Small Entity statement must also be filed. (NOTE 37 CFR 1.9, 1.27, 1.28)			$0	
	TOTAL NATIONAL FEE			$860
	TOTAL FEES ENCLOSED			$860

13. (X) The fee for later submission of the signed oath or declaration set forth in 37 CFR 1.492(e) will be paid upon submission of the declaration.

14. (X) A check in the amount of $860 to cover the above fees is enclosed.

15. (X) The Commissioner is hereby authorized to charge only those additional fees which may be required, now or in the future, to avoid abandonment of the application, or credit any overpayment to Deposit Account No. 11-1410.

SEND ALL CORRESPONDENCE TO:

Gordon H. Olson
Reg. No. 20,319
Customer No. 20,995

H:\DOCS\MOH\MOH-5909.DOC:ad
090501

NEDER27.001APC PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Kuznetsov, et al.	) Group Art Unit Unknown
Appl. No.	:	Unknown	)
Filed	:	Herewith	)
For	:	METHOD AND DEVICE FOR ROTATING A WAFER	)
Examiner	:	Unknown	)

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Prior to examination of the above-captioned application, please amend the application as follows:

IN THE SPECIFICATION:

Please amend the specification as follows:

On page 1, line 2, please insert-- Field of the Invention --;

On page 1, between lines 6 and 7, please insert-- Background of the Invention --;

On page 1, between lines 23 and 24, please insert-- Summary of the Invention --;

On page 3, between lines 29 and 30, please insert-- Brief Description of the Drawings --;

On page 4, between lines 4 and 5, please insert-- Detailed Description of the Invention --;

On page 7, line 1, please replace "Claims" with-- WHAT IS CLAIMED IS: --

IN THE CLAIMS:

Please amend the following claims as indicated:

Please cancel Claims 1-16 as originally filed and Claims 1-12 as amended during international examination without prejudice.

Please add the following new claims:

17. (New) A method of rotating a disc-shaped object, comprising:

floatingly positioning a disc-shaped object in a substantially horizontal position in a compartment including a horizontal top part located above said object and a horizontal bottom part located below said object, wherein at least one of said top part and bottom part includes a pattern of grooves and gas-introduction holes located in said part including said grooves and oriented perpendicular to a surface of said part including said grooves;

injecting a gas flow into the compartment through the gas-introduction holes; and

diverting said gas flow after injection into said compartment into a direction along said grooves to impart rotation to said object, wherein said gas flow provides for a rotation generating component that is tangential to a periphery of said object.

18. (New) The method of Claim 17, wherein rotation generating gas flow is introduced at an upper major surface of said object and a further gas flow is directed along a lower planar surface of the object for supporting said object in a floating manner.

19. (New) The method of Claim 17, wherein said gas flow giving rotation to said object is controlled using a pattern of spiral grooves, wherein an origin of said spiral grooves lies in proximity of a desired center of the object, and a end of said spiral grooves lies in proximity of a periphery of said object.

20. (New) The method of Claim 17, wherein the said gas flow giving rotation to said object is controlled using a pattern of grooves comprising circle segments, wherein each of said

circle segments is provided with at least one gas-introduction hole arranged in proximity of one end of said circle segments.

21. (New) The method of Claim 20, wherein each of said circle segments provided with at least one gas-introduction hole arranged in proximity of one end of said circle segments is provided with at least one gas-discharge hole arranged in proximity of an opposing end of said circle segments.

22. (New) A reactor for the floating, rotational treatment of semiconductor wafers, comprising a top part and a bottom part between which a chamber for accommodating a wafer is delimited, said top part and said bottom part being provided with gas-introduction holes for discharging gas into said chamber, wherein said gas-introduction holes are oriented essentially perpendicular to a surface of the top part and a surface of the bottom part, and that a pattern of grooves is arranged in the surface of at least one of said parts, said pattern of grooves being designed to impart to gas entering into said chamber from said gas-introduction holes a flow component which is tangential to a periphery of a wafer held within said chamber.

23. (New) The reactor of Claim 22, wherein said pattern of grooves comprises a pattern of spiral shaped grooves, wherein an origin of said spiral lies in proximity of a desired center of the wafer, and wherein an end of said spiral lies in proximity of a desired periphery of the wafer.

24. (New) The reactor of Claim 23 wherein in at least one of the parts having grooves in its surface the gas-introduction holes are arranged along a spiral line, wherein the origin of said spiral lies in proximity of the desired center of the wafer, and wherein the end of said spiral lies in proximity of the desired periphery of the wafer.

25. (New) The reactor of Claim 23, wherein said gas-introduction holes are arranged next to said spiral shaped grooves.

26. (New) The reactor of Claims 23, wherein said spiral shaped grooves are designed so as to widen in a direction of a flow of gas.

27. (New) The reactor of Claim 22, wherein said pattern of grooves comprises circle segments, and wherein each of said circle segments is provided with at least one gas-introduction hole arranged in proximity of one end of said circle segments.

28. (New) The reactor of Claim 27, wherein each of said circle segments, which is provided with at least one gas-introduction hole arranged in proximity of one end of said circle segments, has at least one gas-discharge hole arranged in proximity of an opposing end of said circle segments.

REMARKS

The foregoing amendments are to more closely conform the application to U.S. practice. No new matter is added. Entry of the amendments is respectfully requested.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 9/7/01

By: _____

Gordon H. Olson
Registration No. 20,319
Attorney of Record
620 Newport Center Drive
Sixteenth Floor
Newport Beach, CA 92660
(949) 760-0404

H:\DOCS\MOH\MOH-5901.DOC:ad
090401

Method and device for rotating a wafer

The present invention relates to a method for rotating a disc-shaped object, such as a wafer, wherein along a side of said object a gas flow is directed, giving a rotation to said object, wherein said gas flow is given the rotation generating component being tangential to said object by a pattern of grooves.

Such a method is known from US-A-3706475. In this specification a device is disclosed for transporting wafers. The device comprises an elongated trajectory and from the lower side gas is added in such a way that except from a transferring movement also a rotating movement is given to the wafer.

From US-A-393068 a method is known for rotating an object such as a wafer from semi conducting material placed in a reactor. During the treatment of a single wafer which is held floating in a reactor, it is important for a treatment of this nature to be carried out as uniformly as possible. For this purpose, it is proposed, in the prior art, to impart a rotational movement to the wafer. This rotational movement is imposed, according to the prior art, by having the gas-introduction openings opening out not perpendicular to the wafer surface, but rather having them end at an acute angle with respect to the wafer surface ("directional air jets"). As a result, a propulsive movement is imparted to the wafer.

However, drilling the gas-introduction openings in this way has proven to be particularly complicated while, in addition, the rotational speed which can be achieved is limited, owing to the fact that the gas which flows out very quickly loses its tangential flow component. Moreover, reactor walls of this nature are complicated to produce, since openings have to be drilled at an angle with respect to the wall.

The object of the present invention is to avoid these drawbacks while nevertheless maintaining the rotation of the wafer and making it possible, in a relatively inexpensive and simple manner, to impose a rotation of this nature on the wafer.

It is a further aim of the subject invention to accurately position the wafer to realise effective treatment thereof.

This aim is realised with the method as described above in that, said object is floatingly received in a compartment being closed on all sides, said object being substantially rotating only and in that along the other side of said object, a further gas flow is directed.

Through the presence of a groove pattern the gas flow is given a component of

movement extending tangentially to the wafer, i.e. gives a rotating movement to the wafer. Furthermore, the wafer is subjected from the other side to a further gas flow, so that this is accurately positioned in the reactor. Also the gas flows are controlled and provided such that the wafer substantially only rotates and does not execute a translating movement.

According to a preferred embodiment gas flow is blown in a direction substantially perpendicular to said object from a gas introduction opening in the reactor.

Surprisingly, it has been found that by providing a pattern of grooves it is possible to affect the direction of flow of the gas. The gas will preferably begin to flow in the direction of the groove, since this is the path of least resistance. The gas flow is guided in this way over the entire distance which the groove covers. If the direction of the groove contains a tangential component, a tangential flow component is also imparted to the gas. This tangential flow component imposes rotation on the wafer. Grooves of this nature can be produced relatively easily by milling. The pattern of grooves may have any desired shape. According to an advantageous design, the pattern of grooves is arranged in the shape of a spiral. In this case, the grooves are preferably arranged in such a manner that the spiral starts in the vicinity of the centre of the wafer and ends in the vicinity of the circumferential edge thereof. The desired rotational speed can be set by means of the shape of the spiral grooves. The total quantity of gas supplied to the wafer can therefore be selected independently of the desired rotational speed and can be set in such a manner that optimum axial and radial support and a uniform process result can be obtained. This can be achieved by adapting the shape of the spiral grooves. As a result, it is possible to work with comparatively small quantities of gases, as is desirable in order to maintain the uniformity inside the reactor.

This uniformity can be increased still further by also arranging the openings from which the gases emerge in a spiral pattern. This means that, according to a preferred embodiment, the openings extend essentially perpendicular to the surface of the wafer, but if these openings are joined by an imaginary line, the result is a spiral whose origin preferably also lies in the vicinity of the desired centre of the wafer and whose end lies in the vicinity of the circumferential edge thereof. During rotation, a point on the wafer does not always "see" the same openings arranged in a circle, which in the prior art causes an annular treatment pattern.

The combination of the rotation and the spiral pattern of gas-introduction openings results in a particularly uniform distribution of the treatment gases and a

particularly uniform treatment of the wafer surface.

Another possible design of the pattern of grooves consists in constructing this pattern from one or more circle segments. In this case, it is important for a gas-introduction opening to be situated in the vicinity of one of the ends of the groove. In this case too, the gas flow will preferably begin to flow in the direction of the groove. Since the direction of the groove is perfectly tangential, this method of rotational driving has proven particularly effective. Another advantage of this variant is that the rotational driving is virtually independent of the axial bearing of the wafer or, in other words, of the gas flow which keeps the wafer floating. For example, it is possible to increase or interrupt the gas flow for providing the rotational drive, while the gas flow for keeping the wafer floating is maintained at a constant level. As a result, the rotational speed of the wafer changes, while the other conditions in the reactor remain virtually unchanged. Positioning the grooves, which are arranged as circle segments, in the vicinity of the edge of the wafer maximises the drive moment and the efficiency of the rotational drive. Also arranging a gas-discharge opening in the vicinity of the other end of the groove further increases the efficiency of the rotational drive. The direction of rotation is reversed by reversing the direction of flow of the gas through the rotational drive groove.

According to a further preferred embodiment the gas flow imposing rotation to the wafer is, in the case that the wafer is in horizontal position in the reactor, introduced at the upper side of the wafer. I.e. rotational drive can be realised both from above, from below as well as from both sides.

The invention also relates to a reactor for the floating, rotational treatment of semiconductor wafers, comprising a top part and a bottom part, between which a chamber which accommodates the wafer is delimited, the said top part and bottom part being provided with gas-supply openings, the gas-introduction openings extending essentially perpendicular to the top part and/or bottom part and a pattern of grooves, which imparts to the said gas flow a component which is tangential with respect to the said object, being arranged in at least one of the said parts.

This reactor may be provided with the particular designs described above.

The invention will be explained in more detail below with reference to an exemplary embodiment which is illustrated in the drawing, in which:

Fig. 1 shows a diagrammatic, sectional view of a reactor which is provided with a wafer arranged floating therein;

Fig. 2 shows a plan view of the cross section taken on line II-II from Fig. 1;

Fig. 3 diagrammatically shows a spiral with a few important parameters, and

Fig. 4 shows a plan view of a variant of the pattern of grooves according to the invention.

In Fig. 1, a reactor is denoted overall by 1. This reactor is shown only in part and comprises a top part 2 and bottom part 3. In any desired way, which is not illustrated, a wafer 10 may be accommodated in the chamber or treatment space 12 delimited between these parts 2 and 3. The treatment gas for the wafer is introduced via gas-introduction openings 4 both above and below the wafer, and this wafer then adopts a floating position. Gas is discharged via discharge openings 7 which may be of any conceivable form and emerge at a circumferential channel 6 which is connected to a discharge line 5.

In order to impart rotation to the wafer, the top part, as can be seen from Figs. 1 and 2, is provided with a number of grooves 9. These grooves 9 are spiral-shaped, and the origin of the spiral lies in the vicinity of the aimed centre 11 of the wafer 10. The end of the spiral is situated in the vicinity of the circumferential edge of the wafer. Grooves 9 with the shape of a logarithmic spiral are chosen, as illustrated in Fig. 3. In this figure, the grooves are denoted by 9, while the raised part situated between the grooves, which is known as the dam, is denoted by 15; α indicates the groove angle, γ_{groove} indicates the groove width, while γ_{dam} indicates the dam width. θ represents the spiral angle co-ordinate. P1 is the pressure at the internal diameter and P2 is the pressure at the external diameter. The shape of a logarithmic spiral is described by:

$$r(\theta) = r_1 e^{\theta \tan \alpha}.$$

By way of example, the depth of the grooves is approximately 0.15 mm, and there are ten grooves, with a groove/dam ratio of 1:3 and a groove angle of 42°.

It has been found that a significant fraction of gas leaving the introduction openings 4 moves along these grooves 9 (least resistance), thus imposing rotation on the wafer.

Grooves of this nature may be formed in a subsequent stage, in contrast to the oblique drilled holes.

In order to further ensure the uniformity of the gas supply over the wafer surface, the introduction openings 4 are arranged along an imaginary spiral line 8. The origin of this spiral is likewise situated in the vicinity of the desired centre 11 of the wafer.

By varying the various parameters which determine the shape of the groove, it

is possible to control the rotational speed. Some of these factors include the depth of the groove, the groove angle, the groove/dam ratio, the number of grooves, etc. This can be influenced further by effectively positioning the introduction openings 4 with respect to the drive grooves 9.

Tests have shown that with a continuous flow of gas a stable rotation of the corresponding wafer is achieved after approximately 10 seconds starting from an initial situation. Naturally, this too is dependent on the conditions, and this time can be reduced considerably depending on the requirements imposed.

It will be understood that a corresponding design can be arranged on the underside. All this depends on the intended treatment. The speed at which the wafer is rotated is dependent on the process and preferably lies between 2 and 100 rpm.

Fig. 4 shows part of a variant of the invention. In this design, there are no spiral-shaped grooves, but rather a number of circle segments 19 which, in the design illustrated in Fig. 4, lie on the same circle. In the design illustrated in that figure, there are also gas-introduction openings 14 and 16.

As in the preceding designs, the openings extend essentially perpendicular to the plane of the drawing. If gas is introduced through openings 14, in the design in accordance with Fig. 4 the rotation will be to the left, while if gas is supplied from the openings 16, rotation will be to the right. The position of the rotational drive grooves is selected to be in the vicinity of the edge of the wafer, since this maximises the drive moment and the efficiency of the driving. The efficiency of the rotational driving can be increased still further by injecting gas in the vicinity of one end of the groove and discharging gas in the vicinity of the other end of the groove.

It should be understood that it is possible to use a number of circle segments of different radii.

Moreover, it is possible to make various gas-introduction openings, optionally in combination with gas-discharge openings, which are likewise situated in the vicinity of the circle segments. Moreover, in the latter case, the direction of flow between gas-introduction opening and gas-discharge opening can be periodically reversed, if desired.

Moreover, it will be understood from the two variant designs shown above, that other groove patterns are possible; all that is important for the invention is that the local depression caused by the grooves imparts a rotation-creating component to the gas which is blown in the perpendicular direction and may be diverted in the horizontal direction before

the wafer.

Although the invention is described above with reference to a preferred embodiment, variants which lie within the scope of the appended claims will immediately be obvious to people who are skilled in the art after they have read the above text. Although the invention is described with reference to moving a wafer in a reactor, it can equally well be used for moving any other object in any other type of chamber.

Claims

1. Method for rotating a disc-shaped object (10), such as a wafer, wherein along a side of said object a gas flow is guided, giving a rotation to said object, wherein said gas flow is given the rotation generating component being tangential to said object by a pattern of grooves, characterised in that, said object is floatingly received in a compartment being closed on all sides, said object being substantially rotating only and in that along the other side of said object, a further gas flow is directed.

2. Method according to claim 1, wherein said disc shaped object is provided substantially horizontal and said rotation generating gas flow is introduced at the upper side of said disc shaped object.

3. Method according to Claim 1 or 2, characterised in that the said at least one gas flow is controlled using a pattern of spiral grooves.

4. Method according to Claim 3, wherein the origin of the spiral lies in the vicinity of the desired centre (11) of the wafer, and the end of the spiral lies in the vicinity of the desired circumferential edge of the wafer.

5. Method according to Claim 1, wherein the said at least one gas flow is controlled using a pattern of grooves, which pattern of grooves comprises circle segments, and at least one gas-introduction opening is arranged in the vicinity of the said circle segments.

6. Method according to Claim 5, in wherein at least one gas-discharge opening is arranged in the vicinity of the said circle segments.

7. Method according to one of the preceding claims, wherein the wafer is rotated at 2-100 rpm.

8. Reactor (1) for the floating, rotational treatment of semiconductor wafers, comprising a top part (2) and a bottom part (3), between which a chamber (12) which accommodates the wafer is delimited, the said top part and bottom part being provided with gas-supply openings, characterised in that a pattern of grooves (9, 19) is arranged in at least one of the said parts, said pattern of grooves imparts to the said gas flow a component which is tangential with respect to the said object.

9. Reactor according to Claim 8, wherein the gas-introduction openings (4, 14, 16) extend essentially perpendicular to the top part (2) and/or bottom part (3).

10. Reactor according to Claim 8 or 9, wherein the said pattern of grooves comprises a pattern of spiral-shaped grooves (9).

11. Reactor according to Claim 10, wherein, in at least one of the said parts, the said gas-supply openings (4) are arranged along a spiral line (8).

12. Reactor according to Claim 10 or 11, wherein the origin of the said spiral lies in the vicinity of the desired centre (11) of the wafer (10), and the end of the said spiral lies in the vicinity of the desired circumferential edge of the wafer.

13. Reactor according to one of Claims 11 or 12, wherein the said supply openings (4) are arranged next to the said spiral grooves (9).

14. Reactor according to one of Claims 11-13, wherein the said spiral grooves are designed so as to widen in the direction of flow.

15. Reactor according to Claim 8, wherein the said pattern of grooves comprises circle segments (19), and at least one gas-introduction opening is arranged in the vicinity of the said circle segments.

16. Reactor according to Claim 15, wherein at least one gas-discharge opening is arranged in the vicinity of the said circle segments.

Fig-1

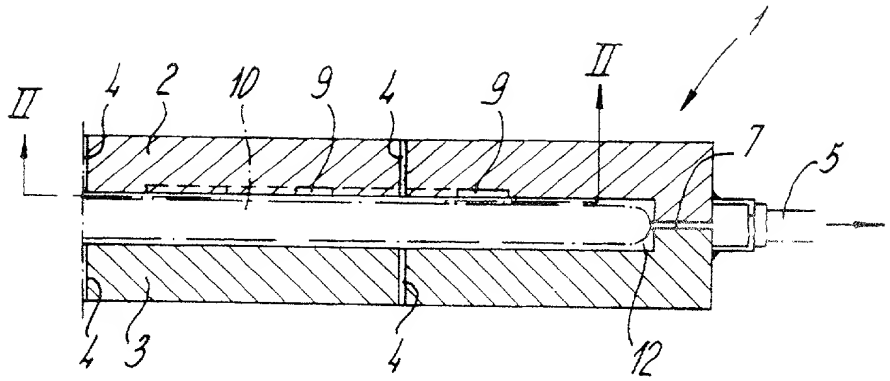


Fig-2

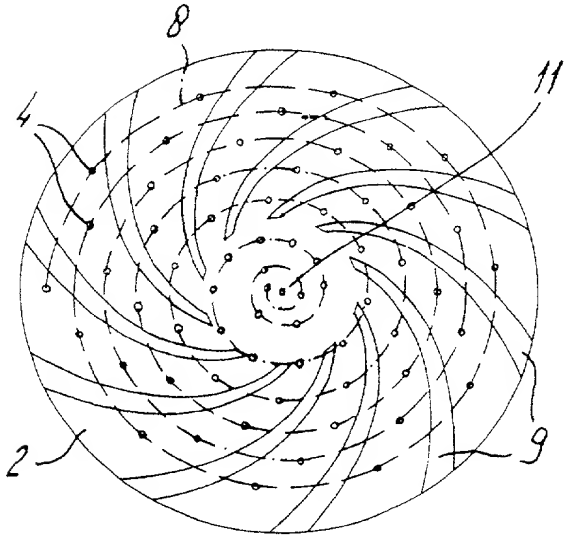


Fig-3

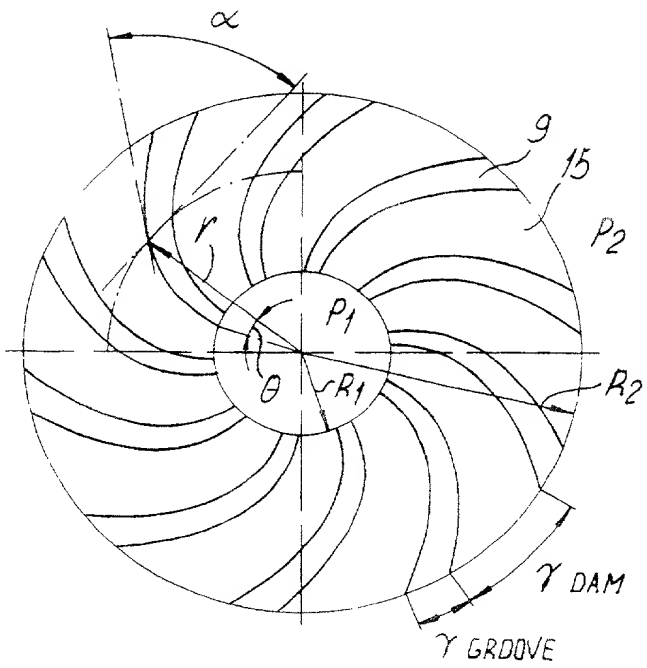
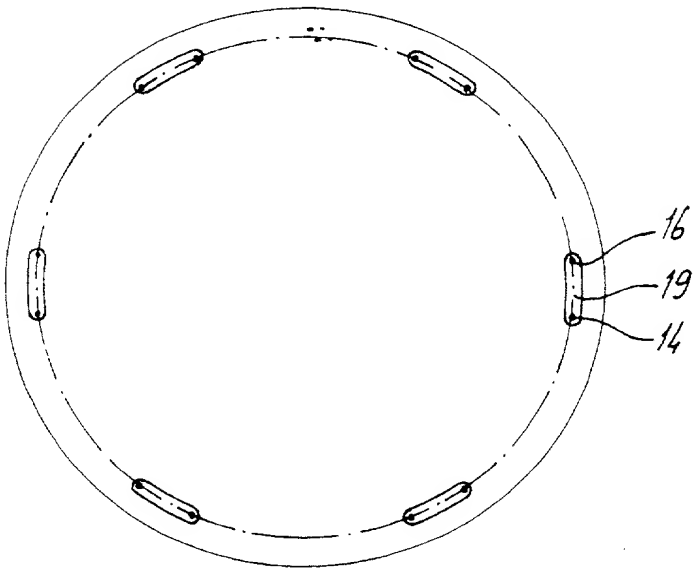


Fig-4



#3

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL DESIGN, NATIONAL STAGE OF PCT OR CIP APPLICATION)

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name, I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Method and device for rotating a wafer

the specification of which: (complete (a), (b) or (c) for type of application)

REGULAR OR DESIGN APPLICATION

a. [ ] is attached hereto.

b. [X] was filed on September 7, 2001 as Application 09/936,257
Serial No. and was amended on
(if applicable)

PCT FILED APPLICATION ENTERING NATIONAL STAGE

c. [X] was described and claimed in International application No. PCT/NL00/00154
filed on 8 March 2000
and as amended on (if any)

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, paragraph 1.56(a).

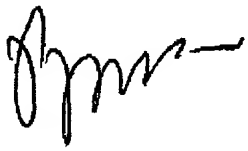
In compliance with this duty there is attached an information disclosure statement 37 CFR 1.97

PRIORITY CLAIM

I hereby claim foreign priority benefits under Title 35, United States Code paragraph 119 of any foreign application (s) for patent of inventor's certificate listed below and have also identified below any foreign application for patent of inventor's certificate having a filing date before that of the application on which priority is claimed.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00 Full name of first inventor: **KUZNETSOV, Vladimir Ivanovich**
Inventor's signature



Date 13 September 2001 Country of Citizenship: the Netherlands
Residence: Delft, the Netherlands NLK
Post Office Address: Buenos Airesstraat 8, NL-2622 AX DELFT, the Netherlands

2-00 Full name of second inventor: **RADELAAR, Sijbrand**
Inventor's signature

Date 13 September 2001 Country of Citizenship: the Netherlands
Residence: Bilthoven, the Netherlands NLK
Post Office Address: Soestdijkseweg 378, NL-3723 HK BILTHOVEN, the Netherlands

3-00 Full name of third inventor: **VAN DER SANDEN, Jacobus Cornelis Gerardus**
Inventor's signature

Date 13 September 2001 Country of Citizenship: the Netherlands
Residence: Geldrop, the Netherlands NLK
Post Office Address: Zomerland 42, NL-5663 HV GELDROP, the Netherlands

4-00 Full name of fourth inventor: **RUIJL, Theo Anjes Maria**
Inventor's signature

Date 13 September 2001 Country of Citizenship: the Netherlands
Residence: Bocholtz, the Netherlands NLK
Post Office Address: Vleugendaal 64, NL-6351 HE BOCHOLTZ, the Netherlands

CHECK PROPER BOX(ES) FOR ANY ADDED PAGE(S) FORMING A PART OF THIS DECLARATION

NEDER27.001APC

COPY

SOLE/JOINT INVENTION
(U.S. Rights only)

ASSIGNMENT

WHEREAS, I/WE:

KUZNETSOV, Vladimir Ivanovich
a citizen of
the Netherlands

residing at
Buenos Airesstraat 8
NL-2622 AX DELFT
the Netherlands

RADELAAR, Sijbrand
a citizen of
the Netherlands

residing at
Soestdijkseweg 378
NL-3723 HK BILTHOVEN
the Netherlands

VAN DER SANDEN, Jacobus Cornelis Gerardus
a citizen of
the Netherlands

residing at
Zomerland 42
NL-5663 HV GELDROP
the Netherlands

RULJL, Theo Anjes Maria
a citizen of
the Netherlands

residing at
Vleugendaal 64
NL-6351 HE BOCHOLTZ
the Netherlands

as assignor(s), have made an invention entitled:

Method and device for rotating a wafer

for which I/we have:

(a) filed an application for United States Letters Patent on September 7, 2001 (Serial No. 09/936,257

(b) executed an application for United States Letters Patent on
and
respectively; and

national phase of international application PCT/NL00/00154 filed 8 March 2000

WHEREAS, **ASM International N.V.**
a corporation of the Netherlands
whose post office address is:

P.O. Box 100
NL-3720 AC BILTHOVEN
the Netherlands

WHEREAS, **Koninklijke Philips Electronics N.V.**
a corporation of the Netherlands
whose post office address is:

Groenewoudseweg 1
NL-4521 BA EINDHOVEN
the Netherlands

as assignee, is desirous of securing the entire right, title, and interest in and to the application for United States Letters Patent on this invention and the Letters Patent to be issued upon this application;

NOW THEREFORE, be it known that, for good and valuable consideration the receipt of which from assignee is hereby acknowledged, I/we, as assignor(s), have sold, assigned, transferred, and set over, and do hereby sell, assign, transfer, and set over unto the assignee, its lawful successors and assigns, my/our entire right, title, and interest in and to this invention and this application, and all divisions, and continuations thereof, and all Letters Patent of the United States which may be granted thereon, and all reissues thereof, and I/we hereby authorize and request the Commissioner of Patents of the United States to issue all Letters Patent for this invention to assignee, its successors and assigns, in accordance with the terms of this Assignment;

AND, I/WE HEREBY further covenant and agree that I/we will, without further consideration, communicate with assignee, its successors and assigns, any facts known to me/us respecting this invention and testify in any legal proceeding, sign all lawful papers when called upon to do so, execute and deliver all papers that may be necessary or desirable to perfect the title to this invention in said assignee, its successors and assigns; execute all divisional, continuation, and reissue applications, make all rightful oaths and generally do everything possible to aid assignee, its successors and assigns, to obtain and enforce proper patent protection for this invention in the United States, it being understood that any expense incident to the execution of such papers shall be borne by the assignee, its successors and assigns.

IN TESTIMONY WHEREOF, I/we have hereunto set my/our hand(s).

Witness:

(Signature of first assignor)
Date 13 September 2001

Witness:

(Signature of second assignor)
Date 13 September 2001

Witness:

(Signature of third assignor)
Date 13 September 2001

Witness:

(Signature of fourth assignor)
Date 13 September 2001